

THE CURRENT STATUS OF THE LESSER MOTTLED GRASSHOPPER, *STENOBOTHRUS STIGMATICUS* (RAMBUR) ON THE ISLE OF MAN

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The discovery of the lesser mottled grasshopper, *Stenobothrus stigmaticus* (Rambur), on the Isle of Man in 1962 was a surprise (Ragge, 1963). Although present in Northern France, the Low Countries and Scandinavia, the grasshopper has not been recorded from any other site in the British Isles. The mystery of the origin of the population on the Isle of Man is discussed by Ragge (1963, 1965) and Burton (1965, 1990). A more immediate practical concern, however, is the lack of quantitative information on the grasshopper's habitat requirements on the island. In 1990, a proposal to extend an existing golf course over much of the grasshopper's site highlighted the importance of such basic data. In late July of that year I visited the island to assess the situation at first hand (Cherrill, 1990), returning in early August 1993 to review subsequent developments. This article reports on these field visits and makes tentative suggestions for the species' conservation.

IDENTIFICATION OF *S. STIGMATICUS*

S. stigmaticus is an inconspicuous green grasshopper, with brownish wings. The most obvious characteristics separating it from other members of the British fauna are its small size and the presence of a tooth on each valve of the ovipositor in females (Ragge, 1965; Marshall & Haes, 1988). In the British Isles, the latter characteristic is shared only by females of *Stenobothrus lineatus* (Panz.) which measure 17–23 mm in length, compared to a length of 12–15 mm for adult females of *S. stigmaticus*. The dimensions of a number of grasshopper specimens collected by the author on the Isle of Man in July 1990 are shown in Table 1. Although the numbers of specimens of each species are low, it is evident that the small overall size of *S. stigmaticus* can be attributed largely to its relatively short wings. Along other dimensions, *S. stigmaticus* is as large or larger than co-occurring specimens of *Myrmeleotettix maculatus* (Thunb.). Both species are considerably smaller than the common field grasshopper, *Chorthippus brunneus* (Thunb.).

DISTRIBUTION

On the Isle of Man, the grasshopper occurs solely on and in the vicinity of the Langness Peninsula which forms the South Eastern tip of the island. The peninsula, which is approximately 2.5 km long and 0.5 km wide, supports a number of historical landmarks including the Sea Mark (usually called the Herring Tower), the Powder House, ancient earthworks and a working lighthouse (Fig. 1). With the exception of a raised beach and small areas of sand-dune and salt-marsh on its western side, the peninsula's shore-line is steeply rocky. The peninsula is renowned for its aesthetic appeal and is an important site for breeding birds. The peninsula lies within an ornithological reserve, but otherwise neither the peninsula nor the grasshopper currently enjoys special protection under Manx law.

The landward half of the peninsula is dominated by a golf course on sand-dunes and blown sand. The seaward portion supports substantial outcrops of slate,

Table 1. Mean linear dimensions of adult grasshoppers collected on Langness Peninsula in July 1990 (all measurements in mm, with standard deviation in parentheses).

Species	Sex	n	Head	Pronotum	Fore-wing	Hind-femur	Body
<i>M. maculatus</i>	M	5	1.96 (0.16)	2.16 (0.15)	8.33 (0.66)	7.20 (0.54)	12.45 (0.94)
	F	14	2.28 (0.11)	2.50 (0.12)	10.14 (0.48)	8.37 (0.42)	14.92 (0.57)
<i>S. stigmaticus</i>	M	12	1.91 (0.21)	2.20 (0.12)	6.76 (0.28)	7.37 (0.48)	10.88 (0.41)
	F	14	2.39 (0.11)	2.88 (0.14)	8.24 (0.62)	9.11 (0.60)	13.51 (0.71)
<i>C. brunneus</i>	M	12	2.22 (0.19)	2.17 (0.21)	12.54 (0.41)	9.29 (9.55)	17.46 (0.64)
	F	11	3.07 (0.24)	3.62 (0.17)	15.77 (0.78)	12.20 (0.65)	22.46 (0.90)

former agricultural land (now reverting to rough grassland) and extensive areas of unimproved vegetation (Garrad, 1972; Allen, 1984). The latter include maritime grassland and heath. In addition to supporting a diversity of invertebrates (Luff, 1990), these plant communities are of some conservation value in their own right.

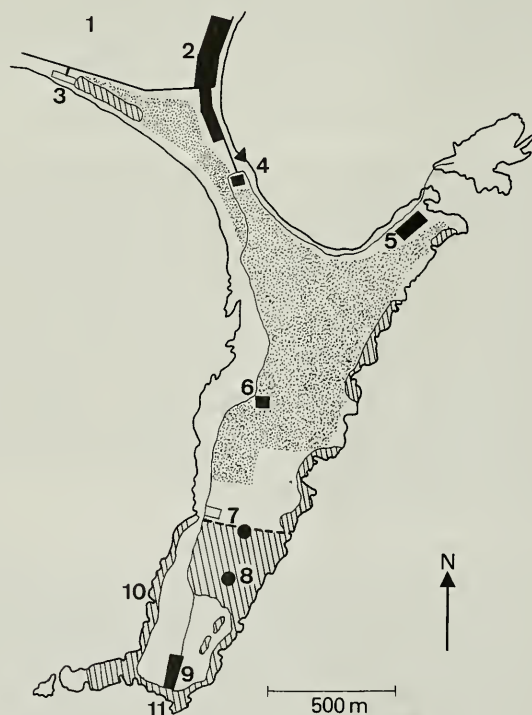


Fig. 1. Map of Langness Peninsula, showing the distribution of *S. stigmaticus* in July 1990 (hatched areas), the golf course (stippled areas) and other features mentioned in the text: 1 Ronaldsway airport; 2 Derby Haven; 3 Sandwick; 4 Kiln and Smelt House (ruins); 5 Hotel; 6 Langness Farm (ruins); 7 car park (open symbol), earthwork (broken line) and Powder House (filled circle); 8 Herring Tower; 9 Lighthouse; 10 The Arches; 11 Dreswick Point.

In the European context, the *Ulex gallii/Calluna vulgaris* heath is a scarce vegetation type (NCC, 1989).

Happily, in 1990, I found the grasshopper to be widely distributed over the peninsula. Although most areas of maritime grassland and heath were occupied, densities appeared to be greatest in the seaward half of the peninsula, and especially around rocky outcrops. In the landward half of the peninsula, the grasshopper occurred only along the eastern edge of the golf course, where maritime turf and heath were restricted to a narrow strip of rocky outcrops and slopes above the shore. Here, and elsewhere, the grasshopper occurred on the edges of cliffs and to within several metres of high water. Evidently, the species is tolerant of vegetation receiving considerable quantities of sea spray. However, in contrast to its occurrence in these exposed conditions, the grasshopper was apparently absent from the golf course and areas of tall grassland in the centre of the peninsula (including areas of former arable land).

Isolated colonies recorded previously (Burton, 1965) on the edge of the golf course near Derby Haven could not be located. However, in some measure of compensation, the grasshopper was found in a narrow strip of fore-dune (measuring roughly 200 m by 20 m), sandwiched between the golf course and the shingle beach at Sandwick in Castletown Bay (Fig. 1). This site represents the first record of *S. stigmaticus* landward of the peninsula's narrow neck.

Due to the proximity of Sandwick to Ronaldsway Airport, and the uncertainty as to the species' origin on the island, the opportunity was taken to search the abandoned Second World War hangar areas, runway aprons and grasslands within the airport's perimeter. A careful search of the southern coastal fringe between Douglas Head (OS grid reference SC382742) and The Chasms (SC192665) was also undertaken (Cherrill, 1990). Both searches, conducted in July 1990, drew a blank, despite ideal weather and seemingly suitable vegetation at many sites. The three other species of grasshopper recorded from the island were widespread. Of these, *M. maculatus* and *C. brunneus* were found to occur with *S. stigmaticus* on the peninsula and at Sandwick. The third species, *Omocestus viridulus* (L.), was recorded in the vicinity of Derby Haven in the late 1960s (Dr Garrad pers. comm.), but now seems to be absent from the areas occupied by *S. stigmaticus*.

Overall, my observations on the distribution of *S. stigmaticus* were encouraging, with the species occurring more widely than was previously thought. Nonetheless, closer consideration of the species' habitat requirements suggests that there may be little cause for complacency amongst those seeking to secure the future of the grasshopper on the Isle of Man.

HABITAT REQUIREMENTS

In Continental Europe, *S. stigmaticus* occurs in a range of habitats, including sheep pasture, moorland and woodland glades. However, only the driest, warmest sites with short turf are occupied (Harz, 1975; Bellmann, 1988; van Wingerden & Bongers, 1989; van Wingerden *et al.*, 1991a, 1991b, 1992). Holst (1986) notes that *S. stigmaticus* occurs at sites similar to, but warmer and drier than, those favoured by the congeneric species, *S. lineatus*. This observation serves to emphasize the curious isolation of *S. stigmaticus* on the Isle of Man, because in Britain *S. lineatus* is restricted to Southern England. Nonetheless, the ecological requirements of *S. stigmaticus* at Langness and in Continental Europe appear to be broadly similar.

My observations on Langness peninsula suggest that *S. stigmaticus* is never found far from short turf (usually less than 5–10 cm tall) and reaches high densities only

where extensive areas of such turf are present (often with a mixture of sparse grass tussocks or heather bushes). Areas dominated by heather (*Calluna vulgaris* (L.) Hull and *Erica cinerea* L.) and western gorse (*Ulex gallii* Planchon) were occupied, but densities appeared to be lower than in more open grassy areas. Densities were particularly high in short maritime turf on the Arches, and along the shore south of the lighthouse at Dreswick Point. Towards the centre of the peninsula densities were greatest around slate outcrops (and especially near the Powder House). At Sandwick the grasshopper occupied an area of short turf, again with only a scattering of grass tussocks.

The floristic composition of the vegetation occupied by *S. stigmaticus* differed greatly between Sandwick and the peninsula, yet its distribution in relation to sward height appeared to be similar. Information on sward structure is difficult to convey without quantitative data. In these circumstances, the distribution of *S. stigmaticus* can perhaps be described most effectively via comparison with the better known habitat preferences of the two co-occurring species, *M. maculatus* and *C. brunneus*. The former species is known to occur exclusively within areas of very short turf (Marshall & Haes, 1988), while the requirements of *C. brunneus* are more complex. The early juvenile stages of *C. brunneus* occur predominantly in areas of short turf, while the later stages are associated with tussocky grass (Richards & Waloff, 1954; Atkinson & Begon, 1988). In comparison with these two species, *S. stigmaticus* was observed to be intermediate in its habitat preferences. Thus, while *S. stigmaticus* was associated with patches of short turf, this relationship was not as pronounced as that exhibited by *M. maculatus*. Conversely, *S. stigmaticus* was rarely found in the taller vegetation occupied by adult *C. brunneus*.

If my interpretation of the species' habitat requirements is correct, the species' absence from short turf on the golf course requires explanation. The most likely cause is the disturbance associated with maintenance of the fairways and playing activity. It is possible that an intensive search of the 'rough' would reveal small colonies surviving on remnants of heath, but the golf course as a whole appears to offer a sub-optimal habitat for *S. stigmaticus*.

THREATS TO THE SPECIES' SURVIVAL ON THE ISLE OF MAN

In 1990 a proposal for the extension of the existing Langness golf course into the seaward section of the peninsula was rejected at public enquiry. Whilst many long-established golf courses are valuable wildlife refuges (NCC, 1990), the applicants' submission that wildlife may actually benefit from the further development of Langness peninsula (RPS Clouston, 1990) gained little credence. Despite this judgement, the future of the lesser mottled grasshopper is yet to be secured unequivocally. By the time the inspector's decision was given, the owners of Langness had already ceased livestock grazing on the peninsula several years previously. At the time of my visit in August 1993, this traditional means of managing the vegetation of the peninsula had not been reinstated with the result that many areas of turf, which supported *S. stigmaticus* in 1990, now appeared to be too tall for the species. Unfortunately, poor weather in 1993 prevented a direct reassessment of the species' distribution.

At Sandwick, and along the rocky shores of Langness peninsula, environmental conditions alone may be sufficient to maintain an open sward of low growing plants. Towards the mid-line of the peninsula, however, *S. stigmaticus* appears vulnerable to shading from unchecked growth of the vegetation. In the continued absence of grazing, the build up of dead plant material presents an additional risk from uncontrolled heath fires.

THE FUTURE

In conclusion, the little information available suggests that ensuring the continued presence of *S. stigmaticus* on the Isle of Man will require careful monitoring of both the species' distribution and the state of its habitat. Preliminary field observations at Langness, indicate that the species' primary requirements is for areas of short turf, perhaps interspersed with sparse tussocks or heather clumps. At the time of writing, grazing has yet to be reinstated and the future management of Langness is uncertain. Resolution of the problem hinges on the success of long-running negotiations between Manx National Heritage (the island's governmental body with responsibility for nature conservation) and the owners of Langness.

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BOOK REVIEW

Hoverflies, by Francis S. Gilbert, with plates by Steven J. Falk, 67pp, 68 half-tone figures & line drawings, 4 colour plates, *Naturalist's Handbooks* 5, Revised 2nd edition, Richmond Publishing Co Ltd, Slough, 1993, ISBN 0-85546-266-8, paperback, £7.95, ISBN 0-85546-256-6 hardback, £13.—This book was well received when originally published by Cambridge University Press in 1986. The new revised edition is very similar; in the acknowledgements the author refers to the opportunity to correct mistakes and the adding of some of the more interesting discoveries in the last few years.

Among the extra information is that on p. 7 which refers to the possible use of *Eristalis* as indicators of pollution, citing an example of such a project in Egypt, but giving no advice as to the pollution thresholds of British species. Since the previous paragraph refers to the larvae using the foulest of foul water, which is true of *E. tenax*, the reader is left unaware that some (most/all?) British *Eristalis* species breed in natural eutrophic conditions that are unpolluted by man. On p. 9 the over-wintering biology of *Eristalis tenax* is a useful addition.

Under *Volucella* (pp. 14-16), the reader is briefly told that the larvae show a range of key evolutionary innovations which led to the evolution of other genera. In the next chapter, on p. 17, there is a short new paragraph on the evolution of hoverflies, with references.

New ecological information is given, as on p. 23 where the discovery of larvae of *Callicera rufa* is mentioned. At the end of chapter 4, p. 36, there is reference to new work on the effectiveness of mimicry.

Just over 18 pages are devoted to the identification of selected common species as in the first edition, complemented by four colour plates; the tone of the plates is different from my copy of the first edition but the quality is overall much the same. The final chapter, on techniques, is essentially the same. The first edition had a compilation of 85 references to hoverflies; the revised edition has 95.

For anyone with the first edition of this book, it would not be worth buying the second edition since the revision is minor. The book remains a useful one for the target audience, especially students and the general naturalist.